October 19, 1994
ARCS 94-325
No Response Requested

Ms. Gretchen Muench
Office of Regional Counsel, Region I
U.S. Environmental Protection Agency
Waste Management Division
J.F.K. Federal Building
Boston, Massachusetts 02203-2211

Subject: ARCS I - EPA CONTRACT NO. 68-W9-0034
WORK ASSIGNMENT NO. 015-1P46
WELLS G & H RD/RA - UNIFIRST SOURCE CONTROL
**ENFORCEMENT CONFIDENTIAL**
DRAFT REVIEW OF SUMMARY OF UNCONSOLIDATED DEPOSITS
AT THE UNIFIRST PROPERTY

Dear Ms. Muench:

Please find enclosed Ebasco's draft comments relative to the review of the PRPs Summary of Unconsolidated Deposits at the Unifirst Property, dated September 2, 1994, prepared for the Unifirst Source Control remedy.

A diskette containing the comments in Wordperfect 5.1 is also enclosed. Should you have any questions regarding these comments please contact me at (617) 451-1201.

Sincerely,

Robert M. Donati, P.E.
Project Manager

RMD/dam
Enclosures

cc: M. Garren
R. Leighton
A. Fowler

Files: ARCS PM 1.1
G&H-15, 4-11 (c/l only), 15-6.2

**ENFORCEMENT CONFIDENTIAL**

EPA WORK ASSIGNMENT NO. 15-1P46
WELLS G & H RD/RA OVERSIGHT
UNIFIRST PROPERTY SOURCE CONTROL

UNCONSOLIDATED-DEPOSITS INVESTIGATIONS
DATED SEPTEMBER 2, 1994

**General Comments**

1. It is apparent from the data presented in this report that the shallow weathered bedrock and shallow groundwater are not being captured by the pumping of UC22. The PRP has also not adequately characterized this area and included it in the overall conceptual model or remediation strategy. To date, discussions of the groundwater and source control remedies have been kept separate. It would appear at this time, however, based on the recent findings, that an evaluation of the overall remedial action, considering both groundwater and source control remedies, is warranted. This evaluation/discussion should preclude any further discussions of alternative source control remedies or alternative cleanup goals.

2. This Comprehensive Report appears to contain a number of inconsistencies, which are detailed in the Specific Comments section, relative to the interpretation of the data and the discussions regarding the site conceptual model. These inconsistencies make it difficult for the reader to follow and comprehend the entire report.

3. The PRP has still not presented a convincing argument justifying the position that SVE is not practical and will not work on this site. In light of the above comment on the PRP's apparent inconsistent interpretation of some of the data, along with the recommendations by the EPA in the SVE Guidance document, the PRP should conduct additional field data (field air permeability tests and/or a pilot study) before making a definitive evaluation of the feasibility of SVE.

**Specific Comments**

1. Section 2.2, page 2-5, paragraph 4

   Monitoring wells should be installed adjacent to UC4, UC5, UC8, UC17 and UC20 to assess shallow groundwater conditions.

2. Section 2.2, page 2-6, paragraphs 1 and 2

   In paragraph 1, the PRP states, "...ground water pumping currently in progress at UC22 does not permanently dewater the shallow bedrock at the east end of the property"; however,

in the next paragraph, the PRP states "...all areas of contaminated ground water beneath the Property are apparently captured by the UC22 pumping well." These two statements are contradictory and require further explanation.

3. Section 3.1, Page 4, paragraph 1

Although the PRP states that "samples collected by the methanol method are deemed to be more representative of actual field conditions", the use of this method is limited to samples above the method detection limit, which is many cases is approximately 500 µg/kg, and thus is not appropriate for samples whose concentrations approach the remedial cleanup levels.

4. Section 3.3.1, page 3-4, paragraph 3

The PRP's statement that, "the free phase DNAPL that accumulated in the well following the construction of UC8 was removed using a bailer" is not consistent with project historical records. It is our understanding that the product remained in the well for some time during which period much of it migrated out of the well screen into the bedrock.

5. Section 3.3.2, page 3-6, paragraph 3

Was test pit TP1 backfilled with clean fill or the natural material excavated from the pit.

6. Section 3.3.2, page 3-8, paragraph 2

The word "informed" should be "confirmed".

7. Section 3.3.3, page 3-11, paragraph 3

When discussing sample results that are "non-detect," the PRP should indicate the detection limit or range of detection limits for the samples, since the methanol method has a higher and sometimes variable detection limit, and the term "nondetect" is only reliable down to the detection limit. This is extremely relevant given that the ROD-mandated cleanup level is lower than the detection limit for the methanol preservation method.

8. Section 3.3.3, page 3-12, paragraph 3

The PRP contends that for the samples locations southwest of the loading dock area, the contaminant concentration patterns "were generally consistent with the hypothesis of upward migration of contamination from the shallow groundwater." This statement is in direct conflict with the analytical data presented for the sample locations southwest of the loading dock. While some of the borings reflect this pattern of higher contaminant concentrations with increasing depth (B5

and UB3), other sample locations in the same area showed the reverse contaminant profiles of higher concentrations at the surface than at depth (B1 and UC7). Other samples in this area other than the four locations listed (B1, B5, UC3, and UC7) were not relevant: no data was presented for UC25 and UC7A, the samples from S71 were at depths greater than 10 feet, and the vapor probes were only sampled at one depth. In summary, the data presented does not appear to show a consistent pattern of contaminant distribution, nor is there enough data to develop some type of consistent trend.

9. Section 3.3.3, page 3-12, paragraph 4

The statement regarding "preferential vapor transport" should specify the media: soil, groundwater, or both.

10. Section 3.3.3, page 3-13, paragraph 2

The volume of soil removed should be specified.

11. Section 3.3.4, page 3-15, paragraph 2

This section summarizes the results of a soil gas survey conducted in September 1992. Serious questions arise as to the reliability of any soil gas survey work in the eastern portion of the site, given the large number of test pits, trenches, and other subsurface activity that has occurred in this area, particularly south of the current loading dock and in the area of the UC22 influent line trench. Each time subsurface excavations are conducted, the excavation is backfilled with more permeable fill material, thus creating areas that could greatly influence vapor migration through the subsurface.

As an example, the PRP states that "vapor concentrations dropped off by about 2 orders of magnitude within a distance of 10 feet to VB2" from SV10 through SV13. However, vapor probes SV10 through SV13 are all located adjacent to or within a test pit or trench area, while VB2 is located in the undisturbed (and much lower permeable) deposits. Thus, it is not surprising to see such a wide variation in soil gas results in this area.

12. Section 3.3.4, page 3-20, paragraph 1

Has the PRP made any conclusions relative to the source of the DNAPL in the waste-oil area? On page 3-16, the PRP states that "based on research concerning use of the Property prior to Unifirst's ownership, ... it was hypothesized that the origin of the waste-oil contamination was some kind of surface release that occurred about the time of the Route 128 road work (1961-1962)." DNAPL or even chlorinated solvents, particularly in the concentrations detected in the waste-oil are not typically associated with roadway construction debris, as the PRP implies. Furthermore, during the excavation of

test pit TPG on September 22, 1992, Ebasco oversight personnel observed the presence of shredded polyethylene sheeting and **uniform patches** in the excavation. It was also noted that this observation was not reflected in the PRP's test pit log or in any discussions in the text. Given the use of this property as a uniform dry cleaning operation, the presence of the uniform patches clearly suggests that waste disposal and releases occurred in this area after ownership by Unifirst, and may have been related to the dry cleaning operation.

13. Section 3.3.5, page 3-23, paragraph 3

The presence of PCE in UC34 and UC35 indicates that contamination is present beneath the building. However, the fact that all of the borings beneath the building do not show some level of contamination is not consistent with the PRPs claim that the contaminant transport mechanism is through volatilization of contaminated groundwater beneath the building. Volatilization from groundwater to the above unsaturated zone should show some level of regional impact in the majority of the borings. At several locations (UC32 and UC33), however, VOCs were not detected in any of the soil samples.

In addition, if the contamination in the unconsolidated deposits were a result of vapor diffusion, it would be expected that the vertical contaminant profile would be increasing with depth, with the highest contaminant levels in the soil just above the water table. However, the contaminant profile for soil borings/test pits beneath the building (i.e., UC34 and UC35) and outside of the building (Test Pit M, to some degree) decreases with depth, with the highest contaminant levels in the surface samples, which seems inconsistent with the vapor migration theory. The presence of PCE contamination in UC34 and UC35 may indicate that a release occurred in the area of these borings. Have potential sources inside of the building, such as floor drains, been evaluated?

14. Section 3.3.5, page 3-21, paragraph 4

The PRP states, "the results of these borings and test pits provided no evidence of lateral transport of DNAPL within the unconsolidated deposits or along the top of the bedrock surface toward UC8, and no continuous zone of soil contamination extending from the previously excavated waste-oil contamination area was identified" and "...the conceptual model was refined to reflect the opinion that the DNAPL had penetrated into the fractured bedrock in the immediate area beneath the waste oil contamination area and had migrated to the location of UC8 within the highly fractured bedrock." Given the mass of contaminants in the bedrock (approximately 2,000 pounds), it is hard to reconcile these two statements. There should be a significant residual contamination trail possibly in the weathered bedrock between the hypothesized disposal area and its point of discovery in UC8.

15. Section 3.3.5, page 3-23, paragraph 3

Shallow monitoring wells should be installed at UC34 and UC35 where PCE was detected in the unsaturated zone.

16. Section 3.4, page 3-24, paragraph 4

This paragraph states, "the lack of indications of surface release areas, the finding of free-phase DNAPL in the shallow bedrock at the location of UC8, and the existence of high levels of dissolved PCE in shallow ground water ... lead to a new hypothesis: that the main source of VOC contamination to the unconsolidated deposits was the upward migration of contaminant vapors ... from the contaminated ground water...." It does not follow that the presence of DNAPL in UC8 is related to vapor migration. The hypothesis needs to be expanded to include the possibility of a zone of significant contamination in the shallow weathered bedrock that may or may not be saturated all or part of the year where residual contamination exists and from which recontamination is occurring.

17. Table 3-4

Table 3-4 lists the depth of sample TPL3A as 14 feet; however, Table 4-1 indicates the depth as 1.4 feet. Table 4-1 also lists the hydraulic conductivity of sample TPJ1A as $6.6x10^{-5}$, not $6.6x10^{-6}$, as is listed in this table. Please correct these discrepancies.

18. Table 3-5

The dates of collection for samples SV-11, SV-12, and SV-13 do not appear to be correct. Please check these dates and correct them, if appropriate.

19. Section 4.1.1, page 4-1, paragraph 2

The PRP's statement that "releases in the area of the waste-oil contamination pre-date acquisition of the site by Unifirst" is not necessarily true (see comment under Section 3.3.4).

20. Section 4.1.1, page 4-3, paragraph 2

The PRP states, "...the immediate area around the former loading dock close to UC8 is not a zone of solvent release, but rather that the DNAPL encountered in UC8 originated from material uncovered in the waste oil contaminated area." The third paragraph on the following page, however, states, "however, attempts to find evidence of lateral DNAPL migration along or near the bedrock contact, by excavation of test pits and screening and sampling along the bedrock contact, both in the immediate vicinity of the waste-oil contamination area and

other locations on the east end of the Property, found no evidence of such migration within the unconsolidated deposits." Adequate rationale for making the first statement in light of the findings in the second statement have not been presented.

21. Section 4.1.2, page 4-3, paragraph 1

This section refers to Table 4-1 for hydraulic conductivity data; however, this table does not show all of the samples listed in Table 3-4 where hydraulic conductivity data was collected (TPJ2A, TPK11A,, and TPK12A, for example). Please explain.

This section states that "the unconsolidated deposits outside of the building have a variable, but generally high, moisture content." In previous reports (page 7 of the Interim Data Report, dated June 13, 1994), the PRP has indicated that lower moisture contents were encountered for the deposits beneath the building, compared to the deposits outside of the building. However, the data presented in Table 3-4 does not support these statements, as it shows little, if any, distinguishable difference between moisture contents observed outside the building and beneath the building. The moisture content for samples beneath the building range from 1.22% to 15.26%, with an arithmetic mean of 6.68%. The samples outside of the building have moisture contents ranging from 3.0% to 15.78%, with an arithmetic mean of 7.11%.

In addition, according to Table 3-4, the range of hydraulic conductivities is approximately $2x10^{-3}$ to $7x10^{-5}$, not $4x10^{-3}$ to $7x10^{-6}$, as is listed.

22. Section 4.1.2, page 4-5, paragraph 2

The statements made in this paragraph relative to vapor migration through the unconsolidated deposits should be qualified by referring to the locations of the vapor probes relative to test pit and trench excavations. The PRP states, "soil-vapor probes did not detect DNAPL within 20 to 30-feet of where residual DNAPL was eventually found to be present." However, test pit excavations located in this "20 to 30-feet" zone between the vapor probe and residual DNAPL source may act to short circuit the vapor migration due to significantly higher permeabilities in the test pit backfill soils.

23. Section 4.1.2, page 4-5, paragraph 3

The PRP indicates that "because the pathways followed by the DNAPL through the unconsolidated deposits may be small in size, and the volume of residual DNAPL also small, DNAPL within a release area may actually disappear over a period of many years...." Adequate investigation of the shallow

unsaturated/saturated bedrock has not been done to be able to justify this statement.

24. Section page 4-5, paragraph 4

This section indicates, "in addition to migration of vapors away from residual DNAPL in the unsaturated zone, there will also be vapor migration upward from areas of contaminated ground water which will also cause low to moderate contamination of the unconsolidated deposits." This seems to contradict, in part, what has been stated on page 4-5, paragraph 2 which is that migration of vapors away from residual DNAPL in the unsaturated zone "...will be relatively slow and will not likely be able to redistribute VOCs effectively...."

25. Section 4.1.2, page 4-6, paragraph 2

The PRP states that "a consistent trend of decreasing soil concentrations upward from the water table ... would not be expected in till and artificial fill such as found on the Unifirst Property." This statement seems to be completely contradictory to previous statements made regarding the contaminant profile (Section 3.3.3, page 3-12) and the "predominant chemical gradient being upward." The theory of significant contaminant concentrations at depths along with the vertical contaminant profile was part of the basis for the vapor diffusion theory.

26. Section 4.2.2, pages 4-8 and 4-9, paragraphs 5 and 8, respectively

The remaining residual contamination should be removed from the area of waste oil disposal (~50%) and the current loading dock (~90%).

27. Section 4.3, page 4-11, paragraph 1

This paragraph states, "... the likely mass of several thousand pounds or more present in the bedrock both on Property and off-Property." Unifirst should present data to support the presence of off property sources.

28. Section 4.5, page 4-13, item 5.

See the above comment regarding off-property sources.

29. Section 4-5, page 4-14, items 9. and 10.

In item 9., the PRP states "the presence of DNAPL in the shallow bedrock is indicated by the findings in UC8. The magnitude of dissolved PCE concentrations and the persistence of high concentrations in UC22 indicate the presence of DNAPL in the deep bedrock and from off-Property sources."

Item 10. states, "ground water contamination is expected to persist indefinitely because of the presence of DNAPL in the bedrock."

The shallow weathered bedrock zone and the shallow ground water not being captured by UC22 have not been adequately characterized and included in the conceptual model or remediation strategy. In addition, there has been no evidence identifying off property sources as being responsible for contamination beneath the Unifirst property.

30. Section 5.2, page 5-1, paragraph 1

Table 2-1 of EPA's Guide For Conducting Treatability Studies Under CERCLA: Soil Vapor Extraction, dated September 1991 (EPA SVE guidance document), which is reproduced in part as the PRP's Table 5-1, has a column entitled Data Collection Requirements, which is not shown in Table 5-1. This column is important in the overall discussion of SVE feasibility as it relates to the EPA guidance document in that it provides a list of data and information requirements (typically collected during screening, selection, or design) to evaluate each of the contaminant characteristics listed. EPA's Table 2-1 indicates that for each of the characteristics listed in Section 5 of this PRP document, except moisture content, the additional data requirements include field measured air permeability test and/or pilot-scale study verification. Neither of these data requirements have been completed on this site.

31. Section 5.2.2, Low Air Permeability, page 5-2, paragraph 1

According to this section, air permeabilities were calculated for 13 samples using moisture content and hydraulic conductivity values. From this data, the relationship between air permeabilities and moisture contents were graphically depicted in Figure 5-1. Using this relationship, the PRP estimated air permeabilities for an additional 36 samples based solely on moisture contents. Appendix C, which shows the air permeability calculations, does not show the regression equation that was used to predict the air permeabilities. The results of the perameter testing (i.e., degree of compaction) should also be shown. In addition, please explain the rationale for using the geometric mean rather than the arithmetic mean to calculate the site-wide average air permeability, particularly in light of the fact that the geometric mean will yield a lower number. It should be noted that the arithmetic mean for the air permeater data was 0.67 darcys, one order of magnitude higher than the geometric mean.

32. Section 5.2.2, page 5-3, paragraph 2

The PRP's statement that "the air permeability values are low in comparison to the values preferred for the application of

SVE is not necessarily true. Of the four samples that yielded air permeability values below $10^{-10}$ $cm^2$ (0.01 darcys), which is acknowledged as the lower limit of permeability values where SVE "may not be feasible" (EPA guidance document), one sample was from TPJ south of the waste-oil area, two samples were from TPK, and one sample was from TPM. Of the samples from TPK, two samples (to depths down to 3 feet) had values less than 0.01 darcys, while the other two samples from TPK were one to two orders of magnitude higher. And in TPM, only one out of three samples was below 0.01 darcys; the other two samples had values two to three orders of magnitude higher. The samples from TPL, beneath the building, had values in excess of 1 to 4 darcys.

The PRP goes on to state that the results from these results from 4 out of 10 samples indicates that the air permeability data is "frequently less than the practical lower limit for SVE." However, what this data appears to suggest is that the "calculated" air permeability results were not consistent or conclusive as to the feasibility of SVE. Using moisture contents alone for estimating air permeabilities is highly empirical and, as the EPA guidance document suggests, should be followed up by the collection of additional field air permeability data, at minimum. "Since truly undisturbed samples of subsurface materials are difficult if not impossible to obtain, in-place determination ... tend to give much more reliable data for natural materials than laboratory measurements (taken from Groundwater Hydrology, Herman Bouwer, 1978)

33. Section 5.2.2, Low Temperature, page 5-4, paragraph 1

The PRP states that at the Unifirst property, "the temperature at depths of 15 feet or more would be expected to be approximately 10°C." Were temperature values collected for this site? If temperature measurements have not been made, then they should be collected in order to accurately evaluate this characteristic; otherwise, the discussion of temperature should be deleted. At this point in the SVE feasibility discussion, the evaluation of temperature should be based on actual field data rather than assumptions or conjecture.

34. Section 5.2.2, High Clay Content, page 5-5

Since the PRP acknowledges that the unconsolidated deposits do NOT have a high clay content, this characteristic should not be included in this discussion. Furthermore, high clay contents do not necessarily make SVE impractical, but would result in the need for field air permeability measurements.

35. Section 5.2.2, Low Porosity, page 5-5

As stated in the EPA guidance document, low porosity values would result in the need for field air permeability measurements.

36. Section 5.2.3, page 5-6

On several occasions in this section, the PRP states that SVE is "seldom, if ever, applied" to circumstances such as found on this site (i.e., shallow contaminant depths, small zones of contamination). What is the basis for these statements?

37. Section 5,2,4, page 5-8

The PRP has concluded, based on the evaluation of each of the contaminant characteristics "identified in EPA guidance," that "SVE would not be a feasible technology for application at the Unifirst Property." However, the EPA guidance suggests that these factors should be used not only to evaluate the feasibility of SVE, but particularly to determine whether the collection of additional field data (field air permeability tests or pilot-scale studies) is appropriate. In fact, the PRP states on page 5-9 that "neither pneumatic testing nor short duration SVE pilot testing could provide more definitive information on factors most critical to the effectiveness of SVE". This statement is not adequately supported by the data and evaluation presented.

38. Section 5.3, page 5-9

The PRP presents a case study from an SVE test performed on a site with "a sandy aquifer having much more favorable conditions to SVE than those in the unconsolidated deposits at the Unifirst Property." The relevance of this case study to the SVE discussion for this site is not clear, given that the site conditions are very different. As Section 3.2 of the EPA guidance document points out, during a literature survey to evaluate SVE effectiveness at other sites, "previous studies or actual implementation at **essentially identical** site conditions may preclude the need for additional studies. The basis for such a decision should be well documented."

39. Section 6.2.3, page 6-4

The PRP proposed, as a potentially alternate source control remedy, to infiltrate a potassium permanganate solution ($KMnO_4$). Alternate source control remedies should not be discussed until the issue of shallow groundwater contamination is resolved. However, if this source control option is considered, and if the site conditions are such that "water and surfactant flushing are not feasible", how will infiltrating $KMnO_4$, which is soluble in water, be more effective? These statements seem contradictory.